Synthesizer [synthesiser]

(Fr. synthétiseur; Ger. Synthesizer; It. sintetizzatore).

An electronic instrument, usually incorporating a keyboard, capable of producing more complex sounds than other electronic instruments that directly imitate traditional acoustic equivalents. As yet no standard form has developed, since synthesizers are mostly used for performing rock music and jazz which is specially composed, arranged or improvised. Several stages can be observed in the evolution of the synthesizer, each seeing the demise of existing companies and the rapid growth of new ones. Some earlier electronic instruments that were called ‘synthesizer’, such as the RCA Electronic Music Synthesizer (1951–2) and the Siemens Synthesizer (1957–9) are better classified as composition machines, as their sounds are not produced in real time (see Electronic instruments, §IV, 5(i)).

The earliest instruments that anticipated aspects of the synthesizer were developed from the late 1940s onwards, principally by Harald Bode and Hugh Le Caine. Sound-generating and -processing devices, assembled from heterogeneous sources in newly founded electronic music studios (such as the oscillator or sound generator, Filter and Ring modulator), were specially designed as parts of a single unit or as individual modules within a console; for the first time such devices had standardized electrical characteristics, enabling certain of their functions to be operated remotely by means of Voltage control. The first commercial synthesizers were marketed in 1964 by Buchla and Robert A. Moog; in the same year Paolo Ketoff in Rome produced the Synket. They were followed in 1968 by the Putney or VCS-3 (EMS, London) and the first Japanese synthesizer (by the company now known as Korg), and in 1970 by the ARP 2500 synthesizer. These early modular synthesizers were designed primarily for use in electronic music studios.

In 1970, to meet the need of an instrument designed for concert perfomance, and in the face of increasing competition in a limited field, Moog launched the Minimoog, a small console containing a monophonic keyboard and a fixed combination of ‘hard-wired’ modules. This appealed to rock musicians; it was soon followed by ARP's 2600 and Odyssey (both 1971). The first polyphonic synthesizers appeared in the mid-1970s, ranging from the electronic organ-like Polymoog (1976) to the more flexible Oberheim Two-, Four-, six- and Eight-Voice synthesizers (1974–5).

Digital synthesis was pioneered in 1971 in the Allen electronic organ. Previous electronic instruments had featured a selection of timbres created by means of filters or other circuitry, each accessible like a pipe organ stop with the operation of a switch or a potentiometer; digital synthesis permitted the programming of timbres (‘voices’ or ‘patches’) in the instrument's software. In the 1980s manufacturers began increasingly to commission patches from external musicians. Some companies provided the user with programming facilities, or offered additional timbres for sale on one of the variety of existing removable storage media, including cassettes, floppy disks, data cards and

plug-in microchips, RAM and ROM cartridges.

The introduction of MIDI (Musical Instrument Digital Interface; see MIDI) in 1983 initiated a more wide-ranging digital replacement for voltage control, whereby instruments and other devices from different manufacturers could be interconnected. The first successful digital synthesizer with MIDI was Yamaha's DX7 (1983). From the mid-1980s a new generation of microcomputers like the Apple Macintosh, Atari ST and PC models could be linked to MIDI synthesizers, and software was written to give users greater flexibility in programming their own timbres.

In the early 1980s some of the most expensive synthesizers, such as the second versions of the Fairlight CMI and Synclavier, offered not only digital synthesis but also the possibility of digitally recording external sounds, a technique known as ‘sampling’ (see Sampler). The E-mu Emulator (1981) was the first ‘dedicated’ keyboard sampler, and in 1985 the Ensoniq Mirage brought the keyboard sampler within the range of many musicians' pockets for the first time. Since then sampling has become the principal method of creating timbres on all types of electronic instruments. Today an enormous selection of timbres from instruments from all over the world, including ‘vintage’ electronic instruments, as well as non-musical sounds, are available for use in synthesizers and samplers, supplied mostly on CDs with substantial storage capacity.

Synthesizers like the DX7 were entirely digital, even though this meant that they lacked such simple analogue devices as a low-pass filter for shaping the final sound. The greater precision of digital electronics caused many musicians to feel a nostalgia for the rougher, more individual character of analogue synthesizers, a trend that is still reflected in the prices of second-hand instruments, which have increased, often substantially, since 1990. In parallel with the increasing sophistication achieved by the designers of digital equipment in creating more realistic sounds that mimic those produced by acoustic instruments, during the 1990s several combinations of the most effective aspects of both analogue and digital synthesis were established: hybrid combinations of both types of circuitry; digital instruments furnished with the multiplicity of controls found on the consoles of analogue instruments; a new generation of analogue instruments benefiting from the experience of digital circuitry; and ‘virtual analogue’ digital instruments based on more accurate analysis of analogue sound generation called ‘physical modelling’. Some of these only became possible through the increased speed and processing power of digital signal processing (DSP) microchips.

See also Computers and music; and Electronic instruments §IV, 5 and 6(iv).